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NOTES ON GEOGRAPHIC DISTRIBUTION

# Amphibia, Anura, Hylidae, *Scarthyla vigilans* (Solano, 1971): Range extension and new country record for Trinidad, West Indies, with notes on tadpoles, habitat, behavior and biogeographical significance

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**ABSTRACT:** We report a range extension and new country record for *Scarthyla vigilans* in Trinidad, West Indies. The species was previously known only from populations on mainland South America. We include notes on behavior, habitat and tadpole development, and discuss the biogeographical significance of the species' presence in Trinidad, particularly with respect to consequences for understanding colonization events on this Caribbean island.

*Scarthyla vigilans* (Solano, 1971) is one of only two species in the genus *Scarthyla* Duellman and de Sá 1988. Originally described from the Maracaibo Lake basin in Venezuela (Solano 1971) and considered, until recently, to be endemic from this bioregion (La Marca 1992; Barrio-Amorós 1998). Recent reports extended the species distribution to include a greater extent of northwest Venezuela (Barrio-Amorós *et al.* 2006; Lampo *et al.* 2008) and northeast Colombia (Acosta-Galvis *et al.* 2006; Armesto *et al.* 2009). Rojas-Runjaic *et al.* (2008) record two further disjunct populations on the eastern Caribbean coast of Venezuela and in the Orinoco Delta. Here we report the first records of *S. vigilans* in Trinidad, West Indies, extending the known distribution of the species beyond mainland South America.

In July 2006, JRD and JMS found many striped tadpoles (Figure 1), identified as *S. vigilans* (following the description in Suarez-Mayorga and Lynch 2001), in a coconut plantation irrigation channel on Columbia Road, South Trinidad (site A in Figure 2: 10°05'03.01" N, 61°53'26.14" W). Tadpoles were positioned vertically in the water column next to submerged grass stems at the edges of the channel. Nine tadpoles were collected and monitored from Gosner stage 36 to metamorphosis. Tadpoles weighed 0.26 ± 0.02 g (mean ± s.e.) and measured 29.7 ± 0.77 mm long (total length) at the start of metamorphosis, with ~64 % of this length represented by the tail. Duration of metamorphosis was 4.40 ± 0.13 days. Post-metamorphic froglets measured ~10mm SVL and had a translucent unmarked green dorsum with a single lateral stripe and a white venter (Figure 3).

Additional *S. vigilans* tadpoles were collected at the same locality in July and August 2007, this time from

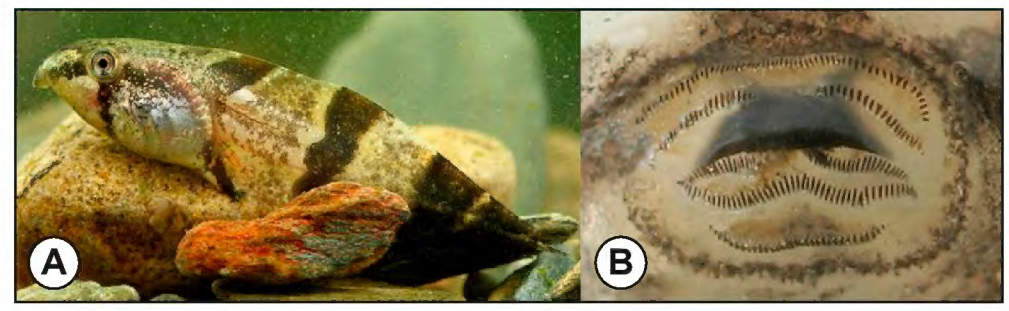


**FIGURE 1.** (A) *Scarthyla vigilans* tadpole collected from Fullarton area, with (B) close-up of mouthpart structure (Photos: V. Ogilvy).

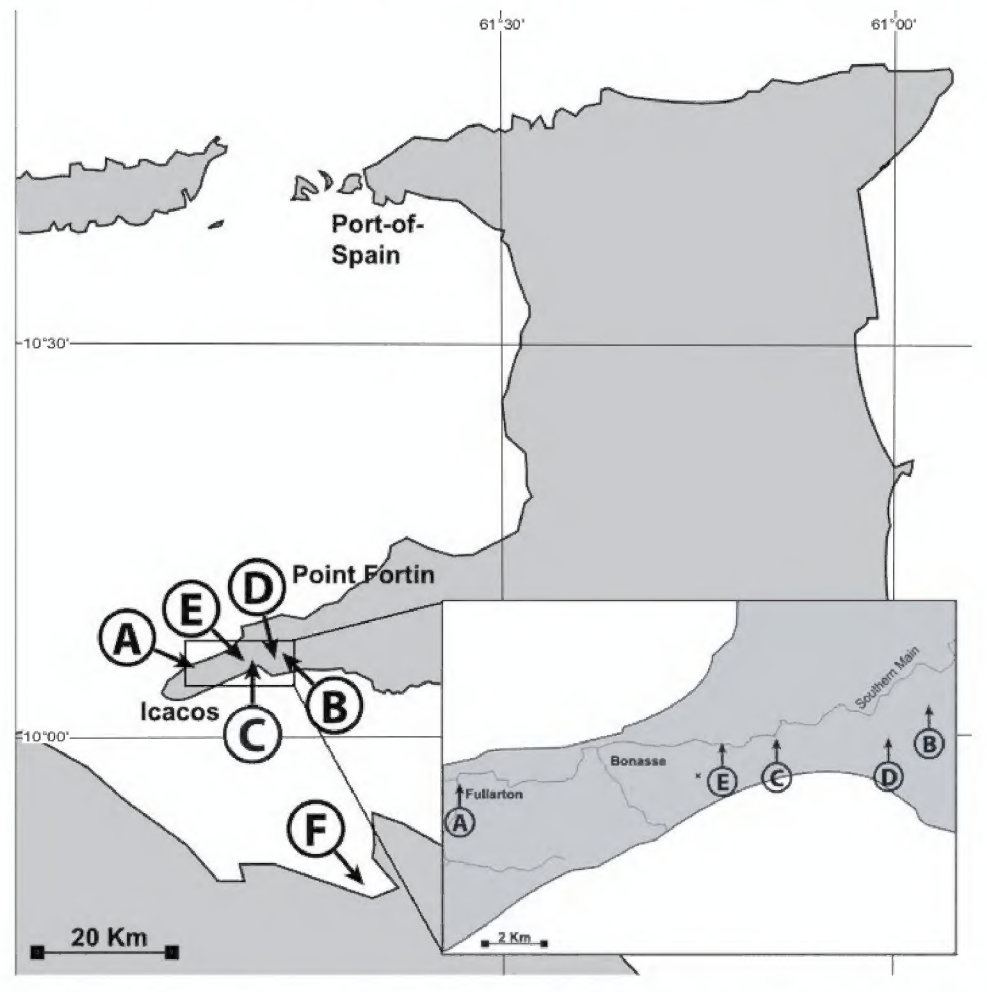


**FIGURE 2.** Current known distribution of *Scarthyla vigilans* in Trinidad (A-E) in relation to closest known mainland population in Venezuela (F). Locations: (A) Columbia Road (B) Bowen Trace (C) Southern Main Road (D) Austin Trace (E) Bonasse Swamp (F) Orinoco Delta (Rojas-Runjaic *et al.* 2008).

vegetation-choked drainage ditches on the edge of flooded grassland growing beneath the coconut plantation (Figure 4A). Tadpoles were found at water margins where vegetation was thickest and were netted together with tadpoles of *Dendropsophus microcephalus*, *D. minusculus* and *Scinax* gr. *ruber*. Twelve tadpoles (Gosner stages 24-36) were collected and deposited in the University of Glasgow's Hunterian Museum (GLAHM 140267, GLAHM 140269).

On July 31 2007, between 15:00 and 17:30 h, RFD, DGT, JMS heard adult *S. vigilans* males calling from a man-made pond (Figure 4B) along the Bowen Trace, southern Trinidad (site B in Figure 2: 10°06'10.92" N, 61°46'49.58" W). Calling activity intensified in breezy conditions and the scratchy twittering call, cricket-like individually, sounded en masse like wind blowing through grass. When approached, frogs would either dive into the water or quickly jump across the water surface and proved difficult to capture. A single frog measuring 17.5 mm SVL (Figure 5A) was collected from this site. No tadpoles were found in several sweeps of the edge margins. *Synbranchus marmoratus* elvers, cyprinodontid fish *Rivulus hartii* and juvenile caiman (*Caiman crocodilus*) were present at the site. Sympatric frog species at this site included: *Pseudis paradoxa,* and *Sphaenorhynchus lacteus*.

**FIGURE 3.** *Scarthyla vigilans* metamorph, Austin Trace (Photo: J.C. Murphy).

Between 19:30 and 20:30 h on August 06 2007, calling was also heard at the Columbia Road site where the tadpoles had first been found. Calling males were found sitting on leaves of low-growing swamp grass in a flooded field. Four frogs were collected, of which three were calling at time of collection, and measured 16.2 (Figure 5B), 16.5 (Figure 5C) and 16.9 (Figure 5D) mm SVL. Calling frogs were pale green at time of collection, with faint dorsal stripes, a dark lateral stripe and indistinct leg markings (*i.e.* Figure 5C). One larger silent frog, darker and more strongly marked, was also collected, measuring 18.7 mm SVL (Figure 5E). All frogs had an unmarked, cream-white venter (*i.e.* Figure 5F). Specimens were deposited in the University of Glasgow's Hunterian Museum: GLAHM 140268 (immature female, Bowen Trace); GLAHM 140270 (3 males, 1 female, Columbia Road).

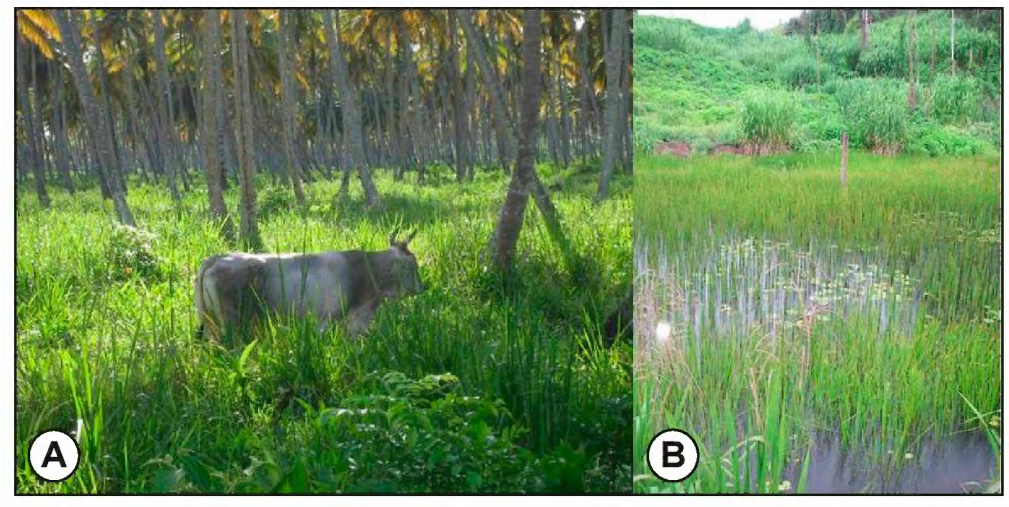


**FIGURE 4.** *Scarthyla vigilans* habitat at (A) Fullarton and (B) Bowen Trace, Trinidad. (Photos: J.M. Smith).

On June 23 2010, between 17:00 and 20:00h MGR, SPC and JCM searched streams and wetlands in the area south of the Southern Main Road between Bonasse and Erin Road. The area is a mosaic of agroecosystems (coconut, rice, cocoa) and herbaceous swamp. *Scarthyla* adults were first collected about 17:00 h along a weed-choked ditch and its inundated floodplain (site C in Figure 2: 10°05'42.74" N, 61°48'58.03" W). Adult frogs were sitting on stems and leaves from the water level to ~0.5 m above the water. At a second location on Austin Trace (site D in Figure 2: 10°05'43.65" N, 61°47'23.48" W), a large chorus of *S. vigilans* was present in the emergent vegetation at the edge of a flooded pool. New metamorphs were also present. *Dendropsophus microcephalus* and *Engystomops pustulosus* frogs were also calling at the site and we noted presence of potential predators such as *Caiman crocodilus* and the cat-eyed night snake, *Leptodeira annulata ashmeadi*. Nine voucher specimens were deposited in the University of the West Indies Museum: (UWITT 2010.21.10, 3 specimens preserved in formalin / UWITT 2010.21.11, six specimens preserved in alcohol).

On 12th July 2010 between 17:00 and 18:00 h, JRD (and colleagues) returned to Austin Trace to check for the presence of *S. vigilans* tadpoles. *Scarthyla* adults were heard calling from vegetation at the margins of flooded ditches on both sides of the track. Using large hand nets, we captured many *Scinax* gr. *ruber* tadpoles on the south side and many *Scarthyla* tadpoles on the north side. On the 14th July 2010 between 09:00 and 10:00 h, two of us (JRD, VO) searched Bonasse Swamp (site E in Figure 2: 10°05'42.74" N, 61°48'58.03" W); *Scarthyla vigilans* adults were calling even at this time. *Scarthyla* tadpoles were the most abundant species caught, with *Scinax* gr. *ruber* and *Dendropsophus microcephalus* also common. A sample of *Scarthyla* tadpoles was deposited in the University of the West Indies Museum (UWITT 2010.21.23).

These first records for Trinidad extend the distribution of *S. vigilans* out of mainland South America and are of particular interest in light of the recent discovery of a population of the species in the Orinoco Delta in Venezuela

(Rojas-Runjaic *et al.* 2008). Figure 2 shows the distribution of the known population in Trinidad relative to this recent range-extension. The Orinoco discharge is one of the single biggest influences on the shoreline of Trinidad in terms of sediment delivery (Kenny 2002). During the wet season the volume of freshwater entering the Gulf of Paria from both the Orinoco and Amazon can result in up to an 80% reduction in salinity levels (Alkins and De Souza 1984; Read 1987) creating potentially more favorable conditions for colonizing amphibians and ample opportunity for mainland fauna to colonize via floating rafts of vegetation.

The discovery of a new species of amphibian for Trinidad on the southwestern Cedros peninsula is intriguing considering other 'recent' amphibian discoveries in the country. The three most recently recorded amphibian species: *Dendropsophus minusculus*, *Leptodactylus nesiotus* (Read 1987) and *Leptodactylus macrosternum* (Kenny 1977) are all exclusively found in this area. *Leptodactylus nesiotus* is thought to be a Trinidad endemic (Heyer 1994) but both *D. minusculus* and *L. macrosternum* have Venezuelan distributions, including the Orinoco Delta (Acosta-Galvis *et al*. 2008; Heyer *et al*. 2008). It has been proposed that the presence of both in Trinidad may be representative of recent colonization events from Venezuela (Kenny 1977; Read 1987).

It is difficult to know how recently this 'colonization' has taken place in Trinidad. It is possible that the species has been present for a while; certainly the numbers in which it is now present in the South appear considerable. Rojas-Runjaic *et al.* (2008) discuss the lack of previous records from the historically well sampled areas in Venezuela in which they were working. They suggest that their recent discovery in those areas is either due to an ongoing geographic expansion by the species or that they may have been under-recorded due to their inconspicuous advertisement calls, particularly where other amphibians with louder calls are active. Armesto *et al.* (2009) and Rojas-Runjaic *et al.* (2008) both record *Scarthyla vigilans* in sympatry with *Dendropsophus microcephalus* and *Scinax* gr. *ruber*, species with loud, shrill calls. In Trinidad, *Scarthyla vigilans* were found sympatrically with *Dendropsophus minusculus, D. microcephalus, Engystomops pustulosus, Sphaenorhynchus lacteus, Scinax* gr. *ruber* and *Pseudis paradoxa,* all of which have louder calls than the obscure, insect-like trill of *Scarthyla vigilans.* It is possible therefore that, in spite of regular night surveys by teams from the University of Glasgow in the South of Trinidad over the past twenty years, the frog has been missed (particularly if burrowing behaviour observed in frogs under captive conditions (JMS, RFD, DGT, personal observations) is

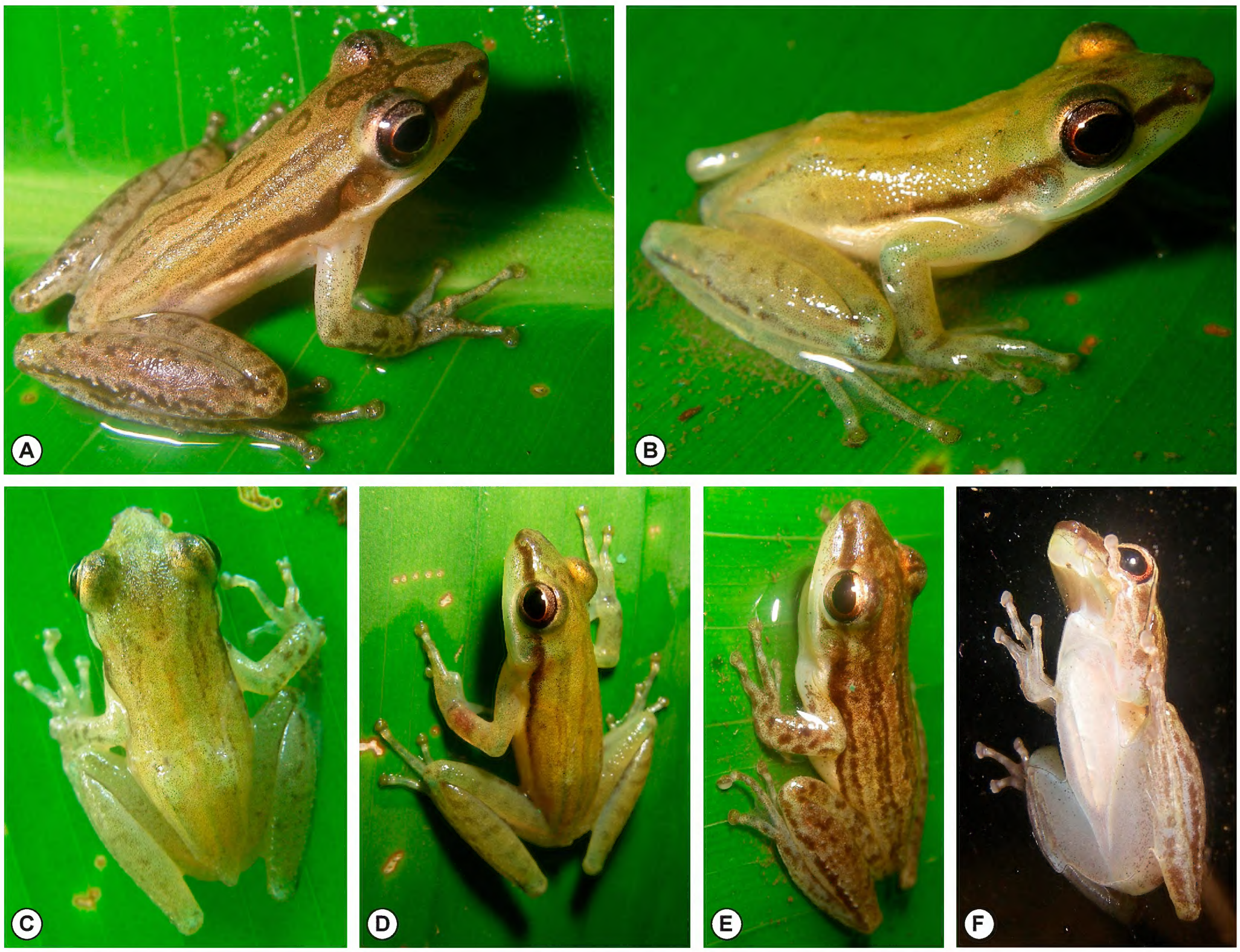


**Figure 5.** *Scarthyla vigilans*, adult frogs from southern Trinidad: (A) Immature female collected from Bowen Trace, 2007: GLAHM 140268 (B-D) Male frogs collected from Columbia Road, 2007: GLAHM 140270 (E-F) Female frog collected from Columbia Road, 2007: GLAHM 140270. For SVL measurements please see text. (Photos: J.M. Smith).

typical). However, the species is one of few in Trinidad which exhibits diurnal calling activity (also reported by Barrio-Amoros *et al.* 2006; Armesto *et al*. 2009) and the areas where tadpoles were found in 2006/07 and 2010 have been systematically netted by some of us (JRD, JMS, VO) for around ten years and neither the diurnally active adults nor the very distinctive tadpoles have been found before. This supports the idea that the species has arrived in Trinidad relatively recently or it may simply suggest a recent localized movement. Genetic work to compare mainland populations with Trinidad's frogs may help to clarify the timescale involved. Furthermore, considering the seemingly fragmented distribution of the currently described populations, genetic analysis of the separated populations is desirable to assess conservation needs for this species.

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